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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/813,157

03/31/2004

Youn-joon Sung

030681-642

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02/28/2006

BUCHANAN INGERSOLL PC  
(INCLUDING BURNS, DOANE, SWECKER & MATHIS)  
POST OFFICE BOX 1404  
ALEXANDRIA, VA 22313-1404

EXAMINER

FINNEREN, RORY B

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 02/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/813,157

Applicant(s)

SUNG ET AL.

Examiner

Rory Finneren

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 6/30/2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Drawings***

Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Kozaki  
(US 2002/00536760)

Regarding claim 1, Kozaki discloses a laser diode comprising:

- a substrate (Fig. 1, #101);
- a lower material layer formed on the substrate (#102-105);
- a resonance layer formed on the lower material layer (#106-109);
- an upper material layer formed on the resonance layer and having a ridge at the top (#110-111);
- a buried layer having a contact hole corresponding to the ridge of the upper material layer (#162, paragraph [0232]);
- a protective layer formed of a material different from the material of the buried layer, and having an opening corresponding to the contact hole of the buried layer (#164); and
- an upper electrode formed on the protective layer to contact an upper surface of the ridge through the contact hole (#120).

Regarding claim 2, Kozaki discloses the claimed invention as outlined in claim 1, wherein the lower material layer includes: a first compound semiconductor layer stacked on the substrate (#103); and a lower cladding layer stacked on the first compound semiconductor layer (#105).

Regarding claim 3, Kozaki discloses the claimed invention, wherein the first compound semiconductor layer is an n-GaN based group III-V nitride semiconductor layer (paragraphs [0065] and [0150]).

Regarding claim 4, Kozaki discloses the claimed invention, wherein the lower cladding layer is an n-GaN/AlGaN layer (paragraph [0154]).

Regarding claim 5, Kozaki discloses the claimed invention, wherein the resonance layer further includes:

a lower waveguide layer (#106) stacked on the lower cladding layer (#105) and having a refractive index larger than that of the lower cladding layer (paragraph [0037], lines 31-);

an active layer (#107) stacked on the upper surface of the lower waveguide layer to generate a laser beam; and

an upper waveguide layer (#109) stacked on the active layer.

Regarding claim 6, Kozaki discloses the claimed invention, wherein the refractive indexes of the upper and lower waveguide layers are lower than the refractive index of the active layer (paragraph [0037], lines 31-).

Regarding claim 7, Kozaki discloses the claimed invention, wherein the active layer is a GaN based group III-V nitride compound semiconductor layer of  $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$  where  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ , and  $x+y \leq 1$  (paragraph [0065]).

Regarding claim 8, Kozaki discloses the claimed invention, wherein the upper material layer includes:

an upper cladding layer (#110) stacked on the upper waveguide layer and having a ridge (paragraph [0126] and Fig. 1) and a refractive index smaller than that of the upper waveguide layer (paragraph [0037], lines 31-);

a second compound semiconductor layer formed on the ridge (#111, paragraph [0166]).

Regarding claim 9, Kozaki discloses the claimed invention, wherein the upper cladding layer is a p-GaN/AlGaN layer (paragraph [0164]).

Regarding claim 10, Kozaki discloses the claimed invention, wherein the second compound semiconductor layer is a p-GaN based group III-V nitride semiconductor layer (paragraph [0166]).

Regarding claim 11, Kozaki discloses a manufacturing method of a laser diode, the method comprising:

forming a laser oscillating structure including a substrate (#101), a resonance layer on the substrate (#106-109), and cladding layers (#105, 110) formed on and under the resonance layer and having a ridge protruding to a predetermined height (paragraph [0126], Fig. 1);

forming a buried layer on top of the structure to cover the surface of the ridge (#162, paragraph [0232]);

sequentially forming a protective layer (#164) and an etch back material layer on the surface of the buried layer;

etching the etch back material layer by an etch back process to a predetermined depth to expose a portion of the protective layer at the upper direction of the ridge (paragraphs [0167]-[0174]);

removing the portion of the protective layer, which is not covered by the etch back material layer, by using an etchant to form an opening which exposes a portion of the surface of the buried layer on the ridge (paragraphs [0167]-[0174]);

removing the etch back material layer remained on the buried layer (paragraphs [0167]-[0174]);

forming a contact hole by etching the portion of the buried layer, which is exposed through the opening of the protective layer (paragraphs [0167]-[0174]); and

forming an upper electrode that contacts to the top surface of the ridge through the contact hole on the protective layer (#120, (paragraphs [0167]-[0174])).

Regarding claim 12, Kozaki discloses the claimed method, wherein the forming of the layer oscillating structure further includes:

forming a lower material layer including a lower cladding layer, on the substrate (#102-105);

forming a resonance layer including an active layer, on the lower material layer (#106-109); and

forming an upper material layer (#110-111), which includes an upper cladding layer and a contact layer and having the ridge protruding to a predetermined height, on the resonance layer.

Regarding claim 13, Kozaki discloses the claimed method, wherein the forming of the lower material layer further includes:

forming a first compound semiconductor layer on the substrate (#103, paragraph [0150]); and

forming the lower cladding layer on the first compound semiconductor layer (#105, paragraph [0153]).

Regarding claim 14, Kozaki discloses the claimed method, wherein the first compound semiconductor layer is formed on n-GaN based group III-V nitride (paragraphs [0065] and [0150]).

Regarding claim 15, Kozaki discloses the claimed method, wherein the lower cladding layer is formed of n-GaN/AlGaN (paragraph [0154]).

Regarding claim 16, Kozaki discloses the claimed method, wherein the forming of the resonance layer further includes:

forming a lower waveguide layer (#106) having a refractive index larger than that of the lower cladding layer (paragraph [0037], lines 31-), on the lower cladding layer (#105);

forming an active layer that generates a laser beam (#107), on the lower waveguide layer; and

forming an upper waveguide layer (#109) on the active layer.

Regarding claim 17, Kozaki discloses the claimed method, wherein the upper and lower waveguide layers are formed of materials having refractive indexes smaller than that of the active layer (paragraph [0037], lines 31-).

Regarding claim 18, Kozaki discloses the claimed method, wherein the upper (paragraph [0162]) and lower waveguide layers (paragraph [0156]) are formed of GaN based group III-V compound.

Regarding claim 19, Kozaki discloses the claimed method, wherein the active layer is formed of GaN based group III-V nitride compound of  $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$  where  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ , and  $x+y \leq 1$  (paragraph [0065]).

Regarding claim 20, Kozaki discloses the claimed method, wherein the forming of the upper material layer further includes:

forming an upper cladding layer (#110) having a refractive index smaller than that of the upper waveguide layer (paragraph [0037], lines 31-), on the upper waveguide layer; and

forming a second compound semiconductor layer on the upper cladding layer (#111, paragraph [0166]).

Regarding claim 21, Kozaki discloses the claimed method, wherein the upper cladding layer is formed of p-GaN/AlGaN (paragraph [0164])

Regarding claim 22, Kozaki discloses the claimed method, wherein the second compound semiconductor layer is formed of p-GaN based group III-V nitride (paragraph [0166]).

Regarding claim 23, Kozaki discloses the claimed method, further including forming a lift-off layer having an opening at a portion corresponding to the ridge, on the second material layer, after the etch back material layer is removed and before the contact hole is formed (paragraph [0171]).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rory Finneren whose telephone number is (571) 272-2243. The examiner can normally be reached on Mon. - Fri. 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Oh Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Minsun Harvey  
Supervisory Patent Examiner  
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rbf